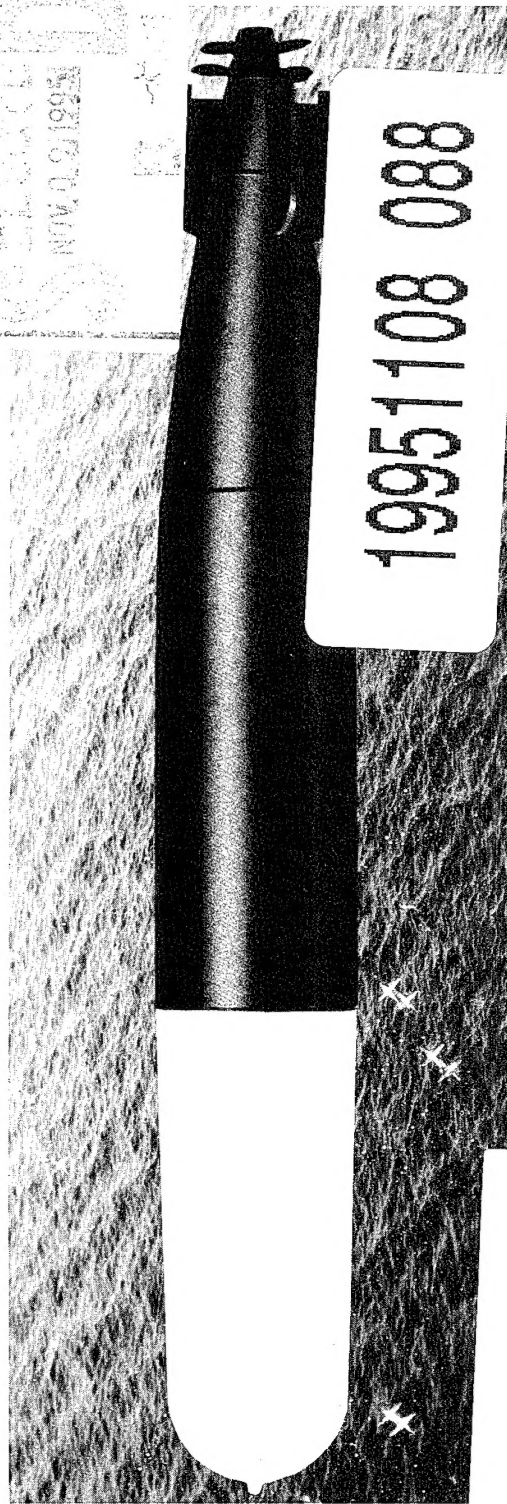


# The Mk 13 Aircraft-Launched Torpedo: A World War II Success Story



NAVAL UNDERSEA WARFARE CENTER DIVISION  
Newport, Rhode Island

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*John E. Sirmalis*

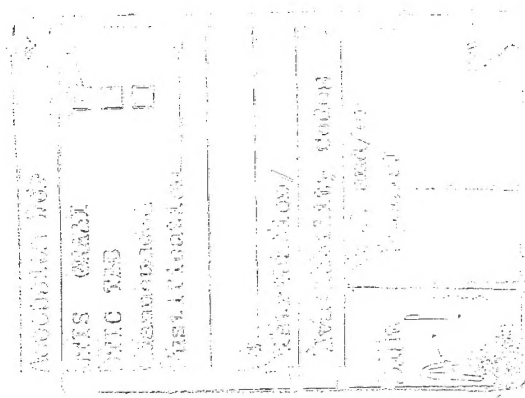
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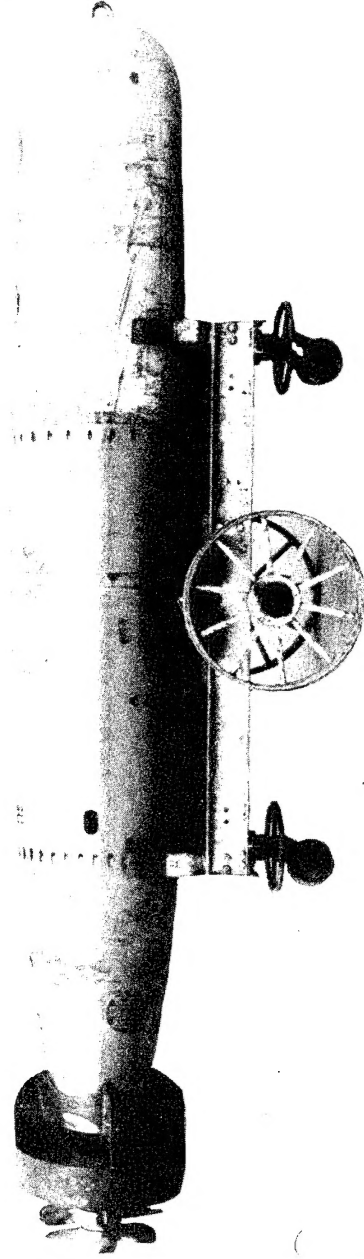
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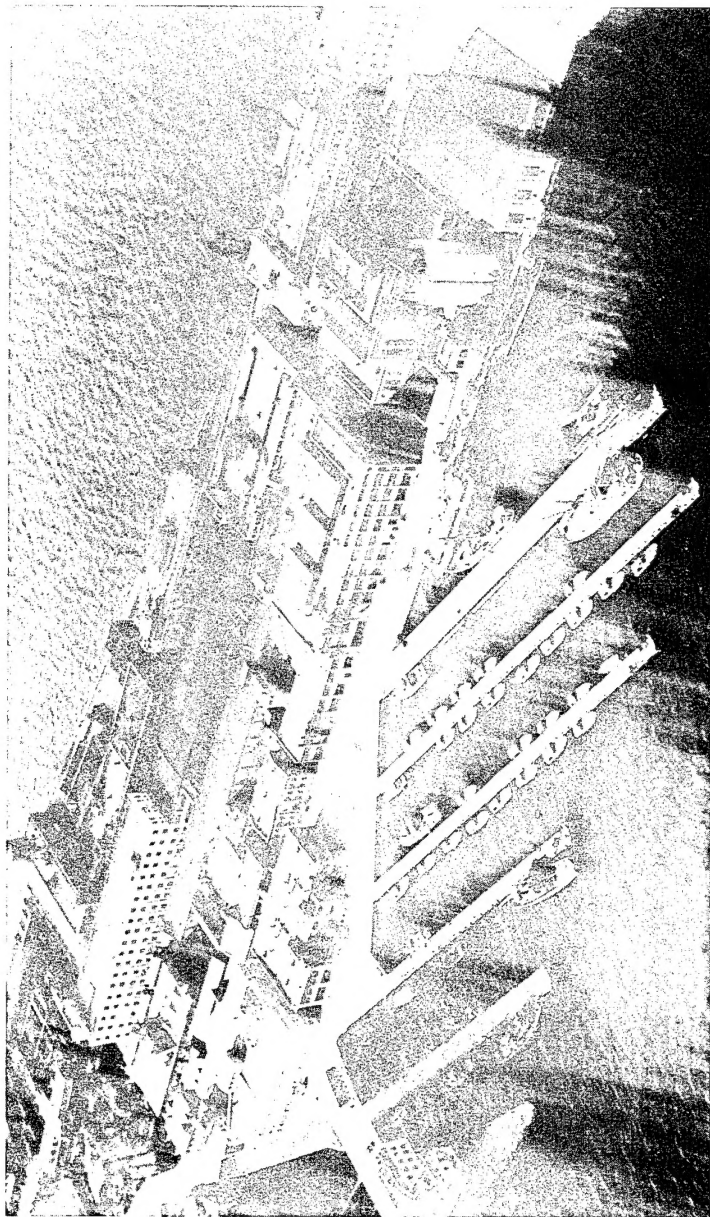
Front cover photo:  
*Model of the Mk 13  
aircraft-launched torpedo.*



Developed by the Naval Torpedo Station in Newport, Rhode Island, the Mk 13 was the first U.S. Navy torpedo designed specifically for aircraft launching. It played a major role during the latter phases of World War II in destroying enemy naval and merchant shipping.

This booklet recounts the development and wartime service of this weapon, which came to be acclaimed as "the best aircraft torpedo in the world."





Naval Torpedo Station Production Complex on Goat Island, Newport, RI, during World War II (September 1943).

# The Mk 13 Aircraft-Launched Torpedo: A World War II Success Story

*When World War II began with such suddenness in December 1941, the United States found itself sorely lacking in equipment, weapon technology, and delivery systems. This void spurred the greatest war mobilization ever undertaken. Numerous efforts were begun to ensure that U.S. fighting forces around the world were equipped with capable and reliable weapon systems and munitions. The design, development, and production of the Mk 13 aircraft-launched torpedo by the Naval Torpedo Station in Newport, Rhode Island, is just one example of the many successes that arose from these efforts.*

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## Introduction

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Almost 50 million tons of torpedoed ships that lie rotting on the bottom of the world's oceans provide indisputable evidence that the torpedo — used by air, surface, and submarine forces — played a major role in 20th century naval warfare. Aircraft-dropped torpedoes, which were widely used by the major participants in World War II, made significant contributions to

many of the major battles and engagements. The British used their torpedoes to cripple the Italian fleet at Taranto in 1940 and to bring the mighty German battleship *Bismark* to bay in the Atlantic. The Japanese employed air-dropped torpedoes with brutal effectiveness in their attack against the anchored U.S. fleet at Pearl Harbor, and also against the cream of Britain's Far East fleet, the *Prince of Wales* and the *Repulse*, in December 1941.

## The Mk 13 Aircraft-Launched Torpedo

U.S. Navy *TBF Avenger* planes launched Mk 13 torpedoes to sink the world's mightiest battleship, the 72,000-ton Japanese *Yamato* in 1945.

Thus, aircraft-launched torpedoes were a key factor both strategically and tactically during World War II, and the Mk 13, developed by the Naval Torpedo Station (NTS) in Newport, Rhode Island, was the U.S. Navy's premier aircraft torpedo.

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### Torpedo Bombers

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In 1910, Rear Admiral Bradley A. Fiske, USN, received a patent for a new weapon system that would combine the high technology airplane and torpedo. About the same time, the Italians and the British conducted some experiments with aircraft-dropped torpedoes. At the beginning of World War I, in 1914, during the Gallipoli campaign, the first successful wartime use

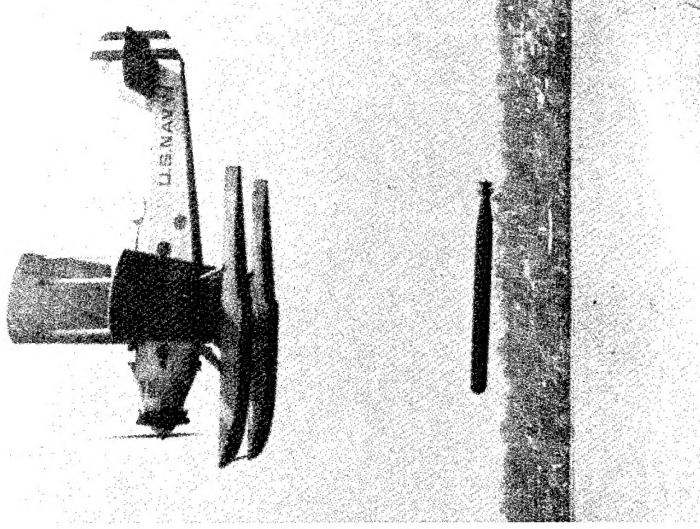
of air-dropped torpedoes occurred when a British plane torpedoed a Turkish vessel. The Germans also built twin-engine *Brandenburg* aircraft to launch torpedoes, and they conducted some successful attacks against British ships late in the war. The U.S. Navy closely monitored these events and, when the idea of building ships to carry planes evolved, the U.S. Navy initiated the development of torpedo bombers for use on its first aircraft carrier, the USS *Langley*.

The first U.S. torpedo-carrying plane, the *PT-1*, was designed and built by the Naval Torpedo Factory in Philadelphia, and NTS Newport modified the Mk 7 torpedo for use by aircraft. The first *PT-1* torpedo planes were delivered to NTS Newport in August 1921, where an aircraft detachment experimented with techniques and tactics for launching torpedoes. The first success-

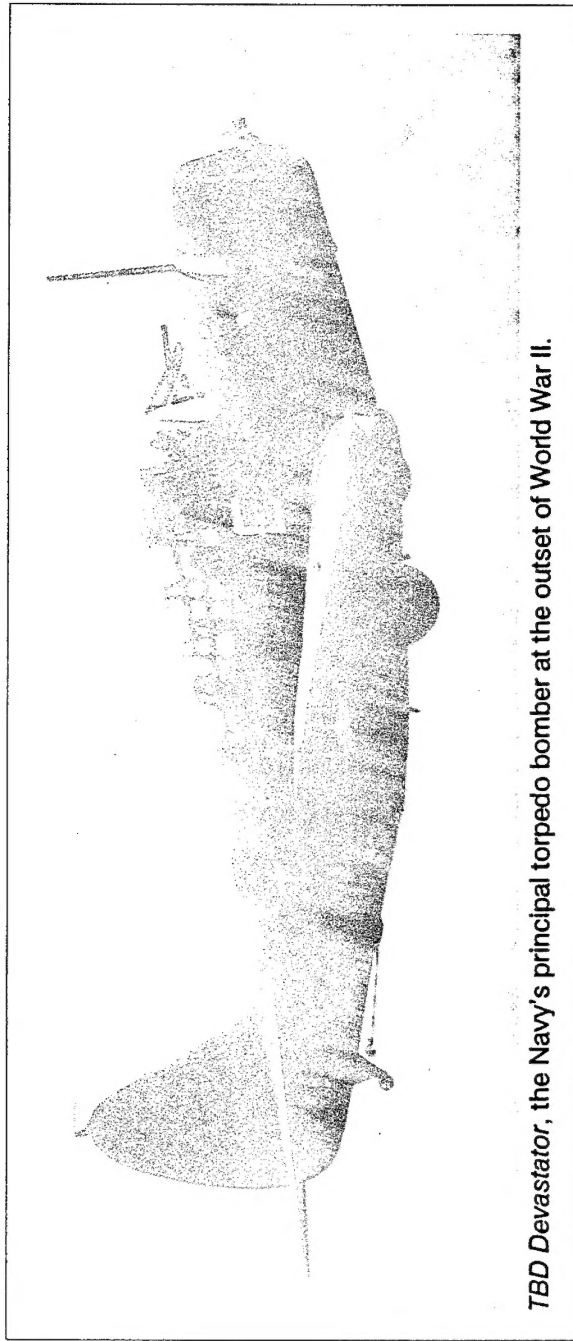
## The Mk 13 Aircraft-Launched Torpedo

ful air drops at NTS were made in November 1921.

As more *PTI* torpedo bombers became available, the first torpedo aircraft squadron, the *VTI*, was formed. When the *USS Langley* was commissioned in March 1922, the *VTI* reported aboard, and the Navy entered a new era during which the aircraft carrier would replace the battleship as the Navy's major fighting machine.



*TG-2* torpedo bomber practicing a torpedo run off Newport in the early 1930s.



*TBD Devastator, the Navy's principal torpedo bomber at the outset of World War II.*



### Mk 13: The Problem Solver

Poor aerodynamic performance of the first air-dropped torpedo, the Mk 7, frequently resulted in deep dives and erratic runs. A possible solution involved the new Douglas DT1 torpedo bomber of 1924. However, even with a launch speed of no more than 95 knots and an altitude as low as 32 feet, highly precise piloting was required to successfully deploy the Mk 7.

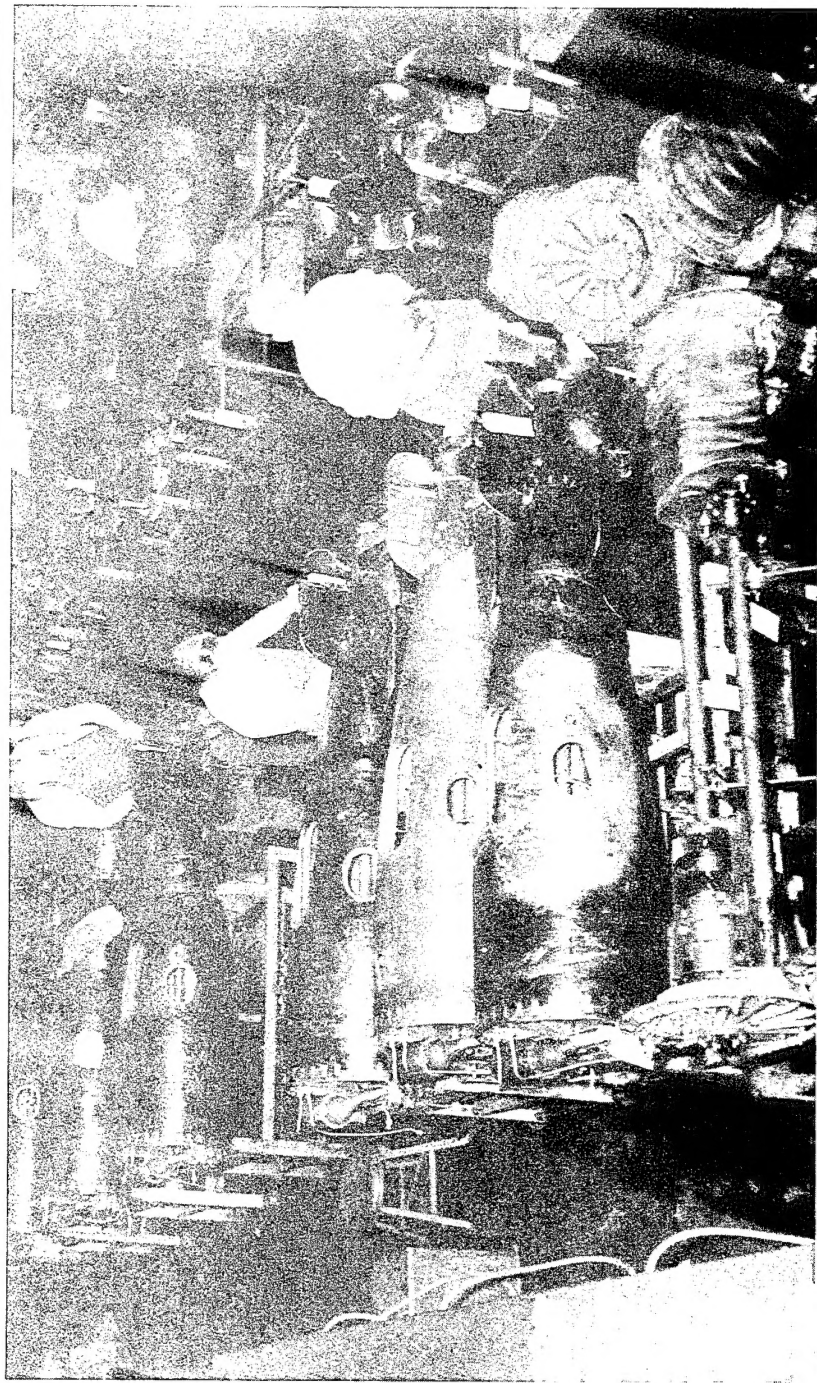
In 1929, the Navy called for an investigation by a General Board to examine the aircraft torpedo issue. The board directed that a larger, 22.5-inch-diameter torpedo, designated the Mk 13, be designed to replace the 18-inch-diameter Mk 7. The board also ordered the development of a high-performance torpedo bomber to launch the new Mk 13 weapon.

NTS began the Mk 13 project in 1930. The early phases were troubled by disagreements between the Bureau of Aeronautics (the aircraft sponsor) and the Bureau of Ordnance (the weapon sponsor) over torpedo size, performance, and launch parameters. Despite these threats to the program's existence, the first prototypes were built, but not until 1934.

### Mk 13 Torpedo Specifications

Length .....	161 inches
Diameter .....	22.5 inches
Weight.....	2200 pounds
Speed .....	33.5 knots
Range .....	6300 yards
Warhead .....	600 pounds

## The Mk 13 Aircraft-Launched Torpedo



Torpedo production line at the Naval Torpedo Station, Newport.

Also, during the 1930s NTS was developing two other torpedoes: the Mk 14 for submarines and the Mk 15 for surface vessels. Limited research and development funding of \$50,000 to \$100,000 per year during the lean inter-war years made it necessary to use common subsystem technologies for all three new torpedoes. This caused serious trouble early in World War II with the torpedo exploder and depth-keeping subsystems on all three torpedoes.

### Mk 13 Goes To War

The Mk 13 torpedo was developed concurrently with the single-wing Douglas *TBD Devastator* torpedo bomber during the 1930s; however, time and money did not allow extensive evaluation. The unfortunate result was that serious limitations were not discovered until the new planes and torpedoes were used in actual combat.

**Problems at Midway.** In 1942, during the Battle of Midway, *TBD* bomber squadrons became separated from their fighter escorts and had to attack Japanese carriers without fighter plane protection. Because the torpedo bombers posed a major threat to the carriers, the enemy sent all available fighters to attack the slow, unescorted bombers. The *TBDs* attacked the carriers, but the nimble Japanese *Zero* fighter aircraft had a turkey shoot. Thirty-five of the 41 *TBDs* were shot down without having scored a single torpedo hit. However, while Japanese fighter planes were being refueled and rearmed, U.S. dive bombers and fighters arrived. The enemy carriers were extremely vulnerable, and the unopposed U.S. planes attacked aggressively. Although the sacrifice of the *TBDs* was not a planned tactic, it was a major factor in the U.S. Navy's victory at Midway.

## The Mk 13 Aircraft-Launched Torpedo

**Mk 13 Improvements.** The Battle of Midway demonstrated that successful Mk 13 air drops required slow, low-altitude, high-risk flying that in turn required fighter escort. An urgent effort was started to make weapon performance match the higher performance of the Grumman *TBF* torpedo bombers that entered the fleet in 1942. This effort involved two projects: a crash program to improve the Mk 13 and development of a new aircraft torpedo, the Mk 25.

Experts in aerodynamics and hydrodynamics from the California Institute of Technology were brought in to work with the Navy. High-speed strip cameras were installed at the NTS range to help in evaluating torpedo air drops; all told, more than 4300 experimental aircraft torpedo launchings were conducted and analyzed. Improvements were systematically evaluated and selectively incorporated to

extend the Mk 13 torpedo's launch parameters. The improvements ranged from minor modifications that increased the reliability of igniters to the addition of a shroud ring that stabilized the torpedo both during flight and water entry.

As a result of this crash program, the Mk 13 was improved dramatically. Now, it could be launched at aircraft speeds up to 410 knots and from an altitude of 2400 feet, versus 110 knots and 50 feet previously. Ultimately, the Mk 13 proved to be a highly reliable and effective aircraft-dropped weapon. Additionally, as the production of Mk 13 torpedoes caught up with wartime needs, the Mk 13 replaced the Mk 8 as the standard PT-Boat torpedo, being launched from deck-mounted roll-off racks.

## The Mk 13 Aircraft-Launched Torpedo

Starting with the Mk 13 Mod 0 and ending with the Mk 13 Mod 13, some 17,000 of these torpedoes were produced during World War II by five different facilities:

NTS Newport; Naval Ordnance Plants in St. Louis, MO, and Forest Park, IL; the GM Pontiac Division; and the International Harvester Company.



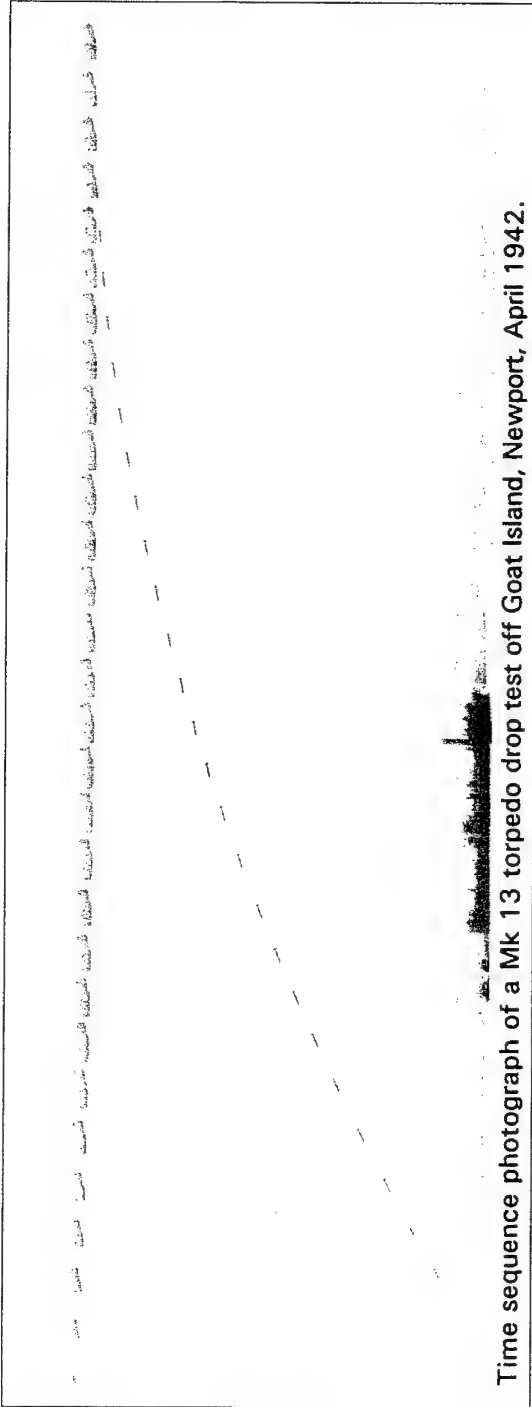
A Mk 13 torpedo being launched from a PT-boat deck-mounted roll-off rack.

## The Mk 13 Aircraft-Launched Torpedo

*The "Best" Aircraft Torpedo.* By 1944, performance reports from the fleet concerning the Mk 13 reflected the intensive improvement efforts. The weapon was now receiving high praise. During World War II, about 1,000,000 tons of enemy ships were sunk by Mk 13 torpedoes. By the end of the war, the Mk 13 was being

referred to as "the best aircraft torpedo in the world."

One final combat mission lay ahead for the Mk 13 torpedo. During the Korean War, repeated bombing attacks failed to damage the crucial North Korean Hwachon Dam, which controlled the depth of the Pukhan

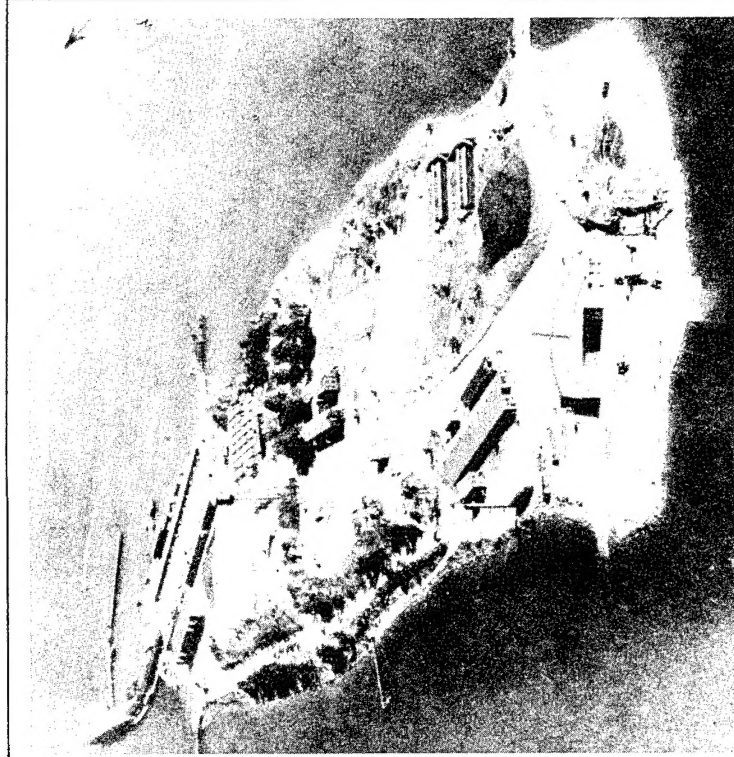


Time sequence photograph of a Mk 13 torpedo drop test off Goat Island, Newport, April 1942.

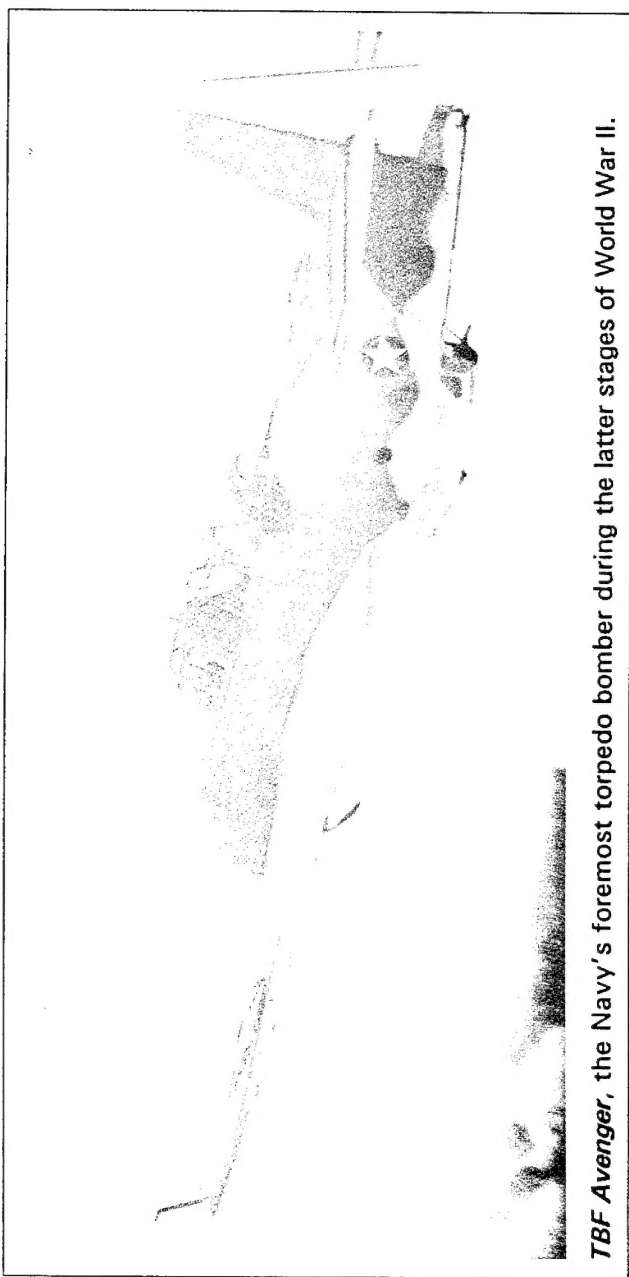
## The Mk 13 Aircraft-Launched Torpedo

and Han Rivers. Eight *Skyraiders* scored six hits with Mk 13 torpedoes and destroyed the dam, demonstrating once more the versatility and effectiveness of the Mk 13 weapon. It is ironic that the Mk 13, in its final wartime mission, was used in support of a land-based campaign.

After World War II and the Korean War, the large-scale cutback in surface naval forces and the demise of the battleship reduced the need for aircraft-dropped torpedoes. A new era of undersea warfare was emerging, and the Mk 13 was soon replaced by smaller homing torpedoes designed to counter the growing submarine threat.



Gould Island and NTS offshore range site where *TBF Avenger* aircraft conducted some 4300 experimental air drops of Mk 13 torpedoes.



*TBF Avenger*, the Navy's foremost torpedo bomber during the latter stages of World War II.



Commentary on the Improved Mk 13 Torpedo from the  
*Naval Aviation News*, 15 March 1945:

Its first use in combat was successful beyond all expectations. A torpedo squadron in August 1944 launched nine torpedoes equipped with rag rings and shroud rings and sank four Japanese cargo ships. No torpedoes were observed to miss.

If anyone still needed to be convinced that the aircraft torpedo could pull its weight in this war, he had his answer when the Commander First Carrier Task Force made the following comment on the shroud ring torpedo: "The torpedo equipped with the Mk 1 shroud ring surpassed expectations. Almost 100% performance was experienced in all attacks. In attacks on shipping in Manila Bay, one squadron dropped 13 torpedoes in water of an average depth of 48 feet. All torpedoes made hot, straight, and normal runs. Seven of them were hits. Personnel responsible for the development of the Mk 1 shroud ring are to be highly commended."

nv/s/jas

All photographs used in this booklet are official  
U.S. Navy photographs.